

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An antenna system comprising:
an antenna element; and
a ground plane comprising:
at least two conducting surfaces each having a plurality of sides defined by at least one edge;
at least one conducting strip connecting the at least two conducting surfaces for allowing current to flow between the at least two conducting surfaces;
~~wherein~~ the at least one conducting strip being is narrower than the width of any of the at least two conducting surfaces;
~~wherein~~ the ground plane being is disposed in a plane substantially parallel to a plane of the antenna element; and
~~wherein~~ the ground-plane further comprising ~~comprises~~ at least one of a space-filling-curve shape and a multilevel structure, wherein the multilevel structure includes:
a set of conducting polygons, the polygons each having the same number of sides;
the polygons are electromagnetically coupled by means of either a capacitive coupling or ohmic contact; and
a contact region between directly connected polygons is narrower than half of the perimeter of said polygons in at least seventy-five percent of said polygons defining the conducting ground plane.
2. (Previously Presented) The antenna system according to claim 1, wherein the at least two conducting surfaces are on a common planar or curved surface.
3. (Previously Presented) The antenna system according to claim 1, wherein:
two edges of the at least two conducting surfaces are substantially parallel to each other, and the at least one conducting strip connecting the at least two conducting surfaces is placed substantially centered with respect to the gap defined by the two substantially parallel edges.
4. (Previously Presented) The antenna system according to claim 1, wherein:
the ground plane includes at least three conducting surfaces, in which one pair of any of two adjacent conducting surfaces is connected by means of at least one conducting strip; and
remaining pairs of adjacent conducting surfaces are electromagnetically connected by means of a capacitive effect or by direct contact provided by the at least a conducting strip.
5. (Previously Presented) The antenna system according to claim 4, wherein the strips are substantially aligned along a straight axis.
6. (Previously Presented) The antenna system according to claim 4, wherein the strips are not aligned along a straight axis.
7. (Previously Presented) The antenna system according to claim 1, wherein the ground plane comprises at least two conducting strips, the at least two conducting strips connecting at

least two of the at least two conducting surfaces at least at two points located at edges of the at least two conducting surfaces.

8. (Previously Presented) The antenna system according to claim 1, wherein at least one of the at least one conducting strip is aligned along an edge defining an external perimeter of the ground plane.

9. (Previously Presented) The antenna system according to claim 1, the ground-plane comprising a plurality of conducting surfaces on the same planar or curved surface, wherein at least two of the conducting surfaces are connected by a conducting strip.

10. (Previously Presented) The antenna system according to claim 1, wherein each pair of the at least two adjacent conducting surfaces are connected by at least one conducting strip.

11. (Previously Presented) The antenna system according to claim 1, wherein all the conducting surfaces defining the ground plane have a substantially rectangular shape, the conducting surfaces being sequentially aligned along a straight axis, each pair of the conducting surfaces defining a gap therebetween, at least two opposite edges of at least one of the gaps being connected by at least one of the at least one conducting strip.

12. (Previously Presented) The antenna system according to claim 1, wherein:
all of the at least two conducting surfaces defining the ground plane have the same horizontal width and are sequentially aligned along a straight vertical axis;
each pair of adjacent conducting surfaces of the at least two conducting surfaces define a gap therebetween;
each pair of adjacent conducting surfaces of the at least two conducting surfaces are connected across the gap by a conducting strip of the at least one conducting strip;
the strip is aligned along an edge of the external perimeter of the ground plane, the edge of the external perimeter is alternatively and sequentially chosen at the right and left sides with respect to a vertical axis crossing the center of the ground plane.

13. (Previously Presented) The antenna system according to claim 1, wherein at least one of the at least one conducting strip is shaped as a zigzag or meandering curve.

14. (Currently Amended) An antenna system comprising:
an antenna element; and
a ground plane comprising:
at least two conducting surfaces each having a plurality of sides defined by at
least one edge;
at least one conducting strip connecting the at least two conducting surfaces for
allowing current to flow between the at least two conducting surfaces;
the at least one conducting strip being narrower than the width of any of the at
least two conducting surfaces;

the ground plane being disposed in a plane substantially parallel to a plane of the antenna element;

the ground-plane further comprising at least one of a space-filling-curve shape and a multilevel structure, the multilevel structure comprising a set of conducting polygons, the polygons each having the same number of sides;

~~The antenna system according to claim 1, wherein:~~

at least one of the conducting surfaces or at least one of the conducting strips of the ground plane is shaped as a space filling curve (SFC), the SFC including at least ten connected straight segments; and

the at least ten connected straight segments are smaller than a tenth of the operating free-space wave length and are spatially arranged in such a way that no two adjacent and connected segments form another longer straight segment.

15. (Previously Presented) The antenna system according to claim 14, wherein the at least ten connected straight segments intersect at tips of the SFC.

16. (Previously Presented) The antenna system according to claim 14, wherein the SFC comprises a plurality of corners formed by each pair of adjacent segments of the at least ten connected straight segments, the plurality of corners each being rounded.

17. (Previously Presented) The antenna system according to claim 14, wherein the SFC is periodic along a fixed straight direction of space if the period is defined by a non-periodic curve comprising at least ten connected segments and no pair of the adjacent and connected segments define a straight longer segment.

18. (Previously Presented) The antenna system according to claim 14, wherein the SFC has a box-counting dimension larger than one, the box-counting dimension is computed as the slope of the straight portion of a log-log graph, wherein the straight portion is a straight segment over at least an octave of scales on the horizontal axis of the log-log graph.

19. (Previously Presented) The antenna system according to claim 1, wherein the SFC comprises at least one of a Hilbert, Peano, SZ, ZZ, HilbertZZ, Peanoinc, Peanodec, or PeanoZZ curve.

20. (Previously Presented) The antenna system according to claim 14, wherein at least one of the at least one conducting strip is shaped as a SFC.

21. (Previously Presented) The antenna system according to claim 1, wherein at least two of the at least two conducting surfaces are connected by at least two conducting strips of different length.

22. (Previously Presented) The antenna system according to claim 14, wherein at least two of the at least two conducting surfaces define a gap, at least a portion of the gap being shaped as a SFC.

23. (Previously Presented) The antenna system according to claim 14, wherein at least half of the surface area of the ground-plane is formed by a strip, the strip being shaped as a SFC.
24. (Canceled)
25. (Previously Presented) The antenna system according to claim 1, wherein the perimeter of at least one of the ground plane and the conducting surfaces is square, rectangular, triangular, circular, semi-circular, elliptical, or semi-elliptical.
26. (Previously Presented) The antenna system according to claim 1, wherein the antenna system is included in a handheld wireless device.
27. (Previously Presented) The antenna system according to claim 1, wherein the antenna system comprises a microstrip patch antenna.
28. (Previously Presented) The antenna system according to claim 1, wherein the antenna system comprises a planar inverted-F antenna (PIFA).
29. (Previously Presented) The antenna system according to claim 1, wherein the antenna system comprises a monopole antenna.
- 30-32. (Canceled)
33. (Previously Presented) The antenna system according to claim 1, wherein the antenna system comprises a multiband antenna.
34. (Previously Presented) The antenna system according to claim 1, wherein the antenna system is used to provide coverage in at least one of a cellular network and a wireless local area network (WLAN).
35. (Previously Presented) The antenna system according to claim 1, wherein the antenna system is mounted inside a rear-view mirror of a motor vehicle to provide coverage in a cellular network, a wireless local area network (WLAN) or both.
36. (Previously Presented) The antenna system according to claim 1, wherein the antenna system is mounted inside a keyless door lock operation device.
37. (Previously Presented) The antenna system according to claim 1, wherein the antenna system comprises a radiating element having substantially the same shape as the ground plane, the radiating element being located parallel or orthogonal to the ground plane.

38. (Previously Presented) The antenna system according to claim 1, wherein the antenna system is included in a cellular telephone, a cordless telephone, a personal digital assistant (PDA), a wireless paging device, an electronic game device, or a remote control.

39. (Previously Presented) The antenna system according to claim 1, wherein the ground plane is included in a handheld wireless device and the antenna device includes a microstrip patch antenna configuration or a planar inverted-F (PIFA) antenna configuration.

40. (Previously Presented) The antenna system according to claim 1, wherein opposing edges of adjacent conducting surfaces of the at least two conducting surfaces are linear in shape and disposed one from the other in a generally parallel spaced relationship.